Decision Support Tools for Restoration Prioritization

The NOAA Coastal Services Center, Landscape Characterization and Restoration (LCR) Program Perspective

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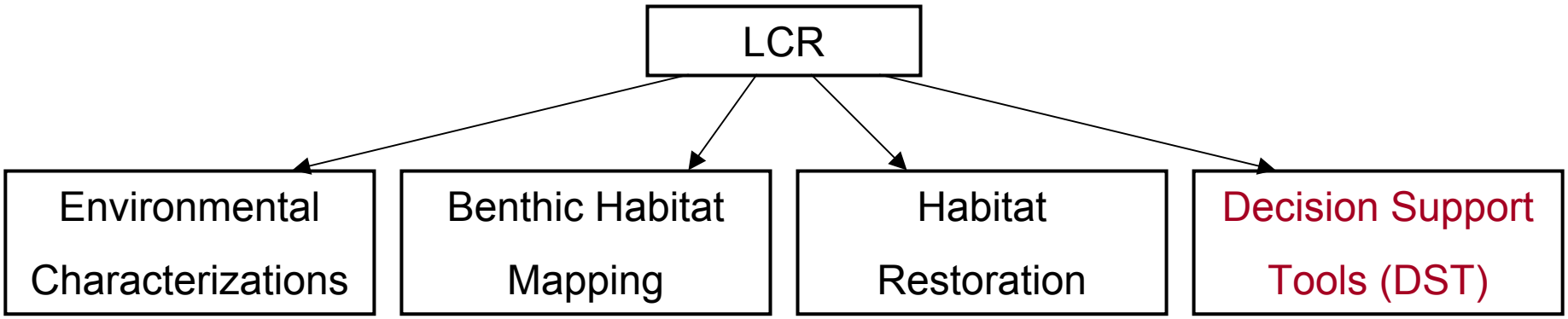
Decision Support Tools for Priority Setting

About LCR

The main goal of the LCR program is to *help coastal resource managers examine the effects of management actions on coastal habitats*.



With state and local partners!

Decision Support Tools for Priority Setting

What Is a Decision Support Tool?

A model designed to help make decisions by answering questions, solving problems, and testing conclusions.

- **Often computer-oriented**
- **User-friendly**
- **Consistent**
- **Efficient**
- **Vary in complexity**
- **May be GIS-based (spatial decision support tool)**

Decision Support Tools for Priority Setting

LCR's Perspective

All of LCR's decision support tools share common elements:

- **Generally used as screening tools**
- **Follow similar development processes**
  - Criteria are developed in partnership with local experts, scientists
- **Vary in complexity from simple data overlay to landscape analyses**
- **Allow end-users flexibility**
  - Setting weighting factors in the scoring regime

Suitability = Ecology + Economics + Engineering + Aesthetics

$$\text{Suitability} = a_1x_1 + a_2x_2 + a_3x_3 + a_4x_4 + \ldots a_nx_n$$

Constraints: x_n ranges from 0 to 100
a_n sum to 1.0

Suitability ranges from 0 to 100

Decision Support Tools for Priority Setting

LCR Decision Support Tool Examples

- **Rhode Island Habitat Restoration Site Selection Tool for Sea Grass**
- **Rhode Island Habitat Restoration Site Selection Tool for Salt Marsh**
- **Lake St. Clair Integrated Coastal Management (ICM) Tool**
- **Southern California Riparian Ecological Assessment Method (SCREAM)**

Decision Support Tools for Priority Setting

DST Development Process

Work with state or local partners to

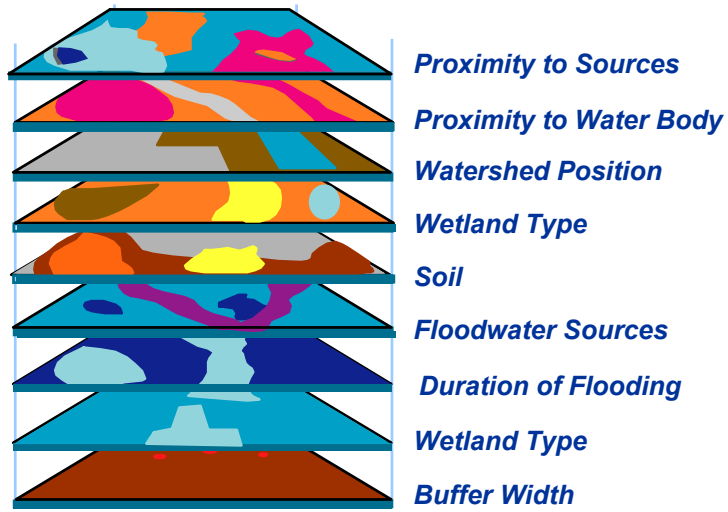
- **Determine/identify their restoration management needs**
  - To conserve or enhance coastal habitat
- **Define the questions, problems, or conclusions to be tested**
  - Where can corridors/connections be made between habitat types
  - Determine metrics
    - Nearest neighbor, proximity, percent habitat nearby
- **Determine the desired inputs and outputs (content and format)**
  - Land cover (habitat types)
  - Site identification and scoring/ranking scheme
  - Maps, reports, tables

Decision Support Tools for Priority Setting

DST Development Process

Work with state or local partners to

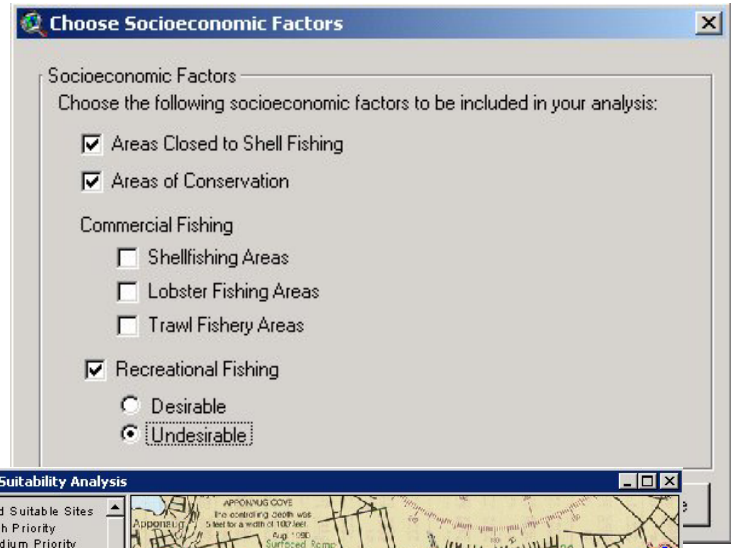
- **Determine the type/design of DST needed**
  - Define metrics
  - Develop conceptual design
- **Develop/build tool**
  - Review and collaborate at critical stages
- **Deliver final tool and conduct training**

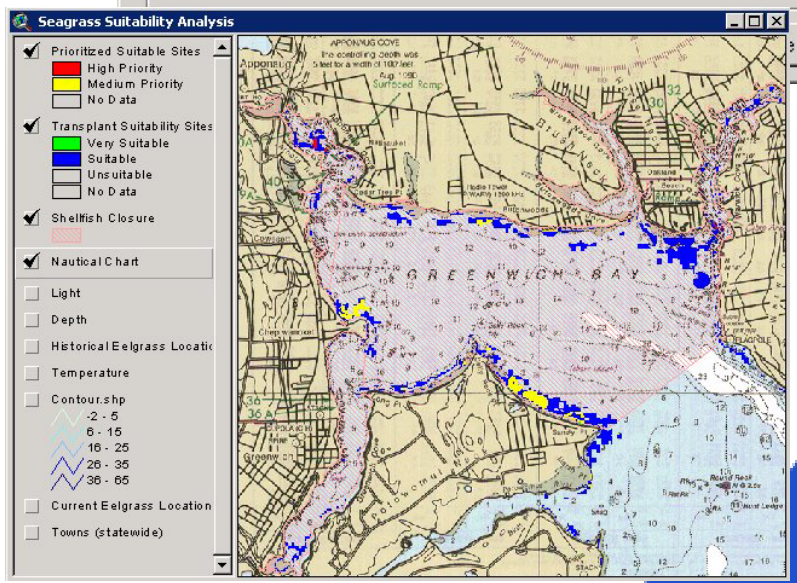


Decision Support Tools for Priority Setting

Sea Grass Site Selection Tool

- **Developed based on stakeholder needs and available data**
- **GIS-based site identification and prioritization tool for eelgrass restoration opportunities**
  - Prioritize sites to
    - Avoid known fishing areas
    - Target shellfish closure areas
  - Evaluate transplant suitability based on
    - Environmental conditions
    - Historical presence

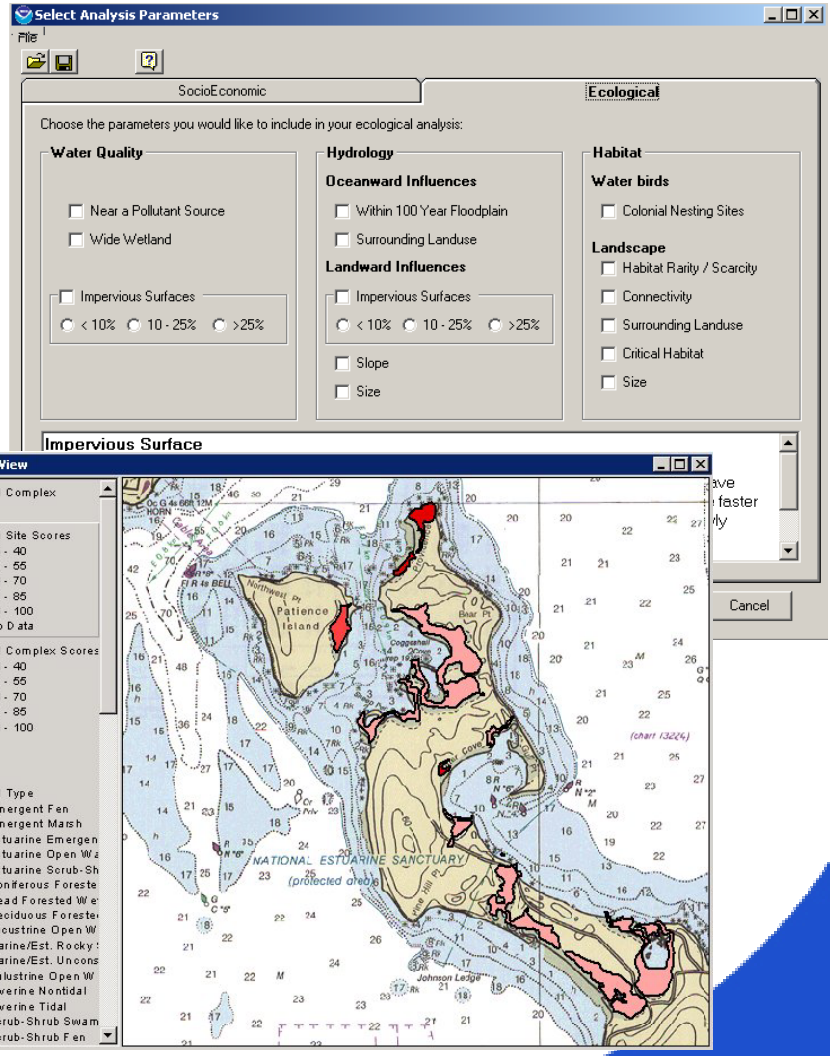




Decision Support Tools for Priority Setting

Salt Marsh Site Selection Tool

- **Developed based on stakeholder needs and available data**
- **GIS-based site identification and prioritization tool for salt marsh restoration**
  - Feasibility, socioeconomics, and demographics
  - Ecological function
  - Results form the basis of site-specific evaluation



Decision Support Tools for Priority Setting

Lake St. Clair ICM Tool

- **Developed based on available and potential data to support a Lake St. Clair Coastal Habitat Restoration and Conservation Plan**
- **GIS-based tool for identifying and prioritizing habitat for restoration and conservation and examining management decisions**

– Evaluates and scores the current habitat situation (landscape analyses)

– Use scenario testing to change land cover types and assess how they change the habitat situation

Decision Support Tools for Priority Setting

Metrics

- **Habitat connectivity**
  - Nearest neighbor
  - Proximity
- **Habitat quality**
  - Size
  - Core area
  - Impervious surface
  - Distance to streams
  - Shoreline hardening
  - T/E species
  - Invasive species
- **Aquatics**
  - Depth
  - Turbidity, temperature
  - Current (velocity, direction)
  - Pollutants

Lake St. Clair ICM Tool

Current Habitat	
Total Area (acres)	1055.7
Average Size (acres)	2.5
Number of Patches	419

Habitat after Changes	
Total Area (acres)	1057.7
Average Size (acres)	2.6
Number of Patches	406

Decision Support Tools for Priority Setting

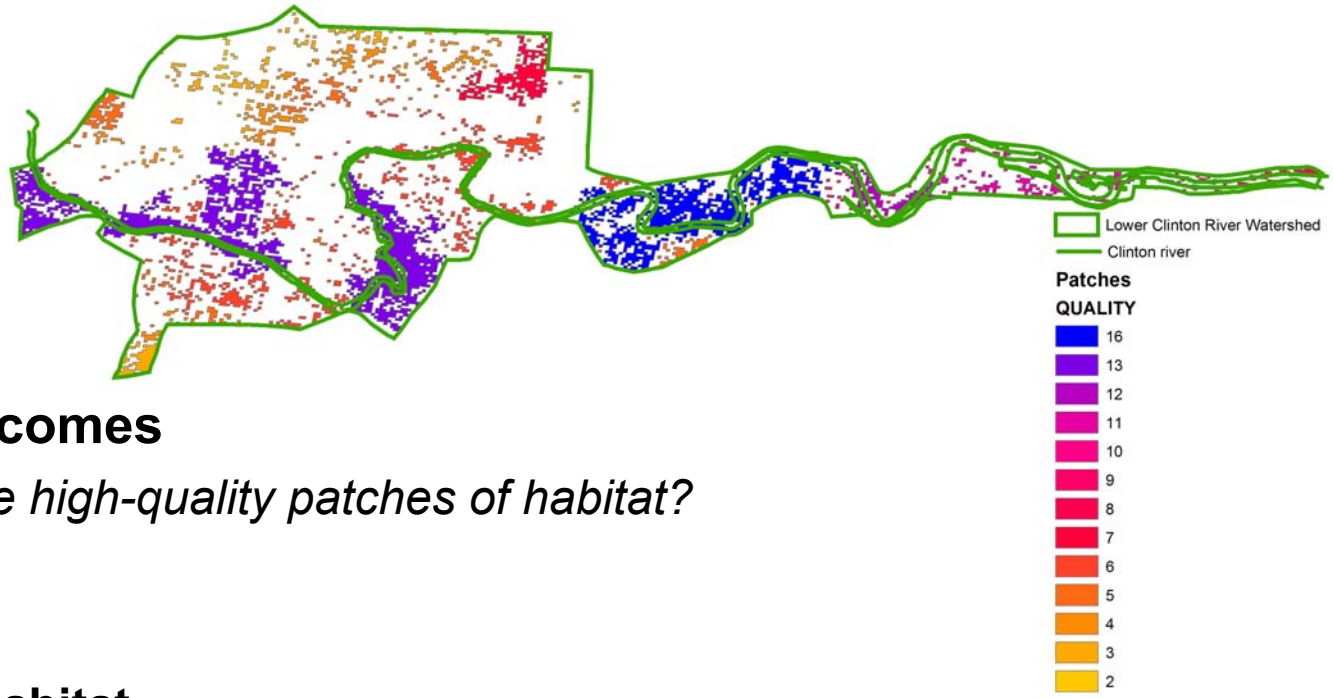
Lake St. Clair ICM Tool

Components and Functionality

- **Data inputs**
  - Requires land cover
  - Other data optional
- **User chooses area of analysis**
  - Draw area
  - Select polygon or geographic boundary
- **User chooses what is habitat**
  - Simple, unique, grouped
- **Flexible scoring**
  - User determines values and scoring regime
- **Queries and overlays**
  - Metric, category, total, and aggregate queries
  - Percentage natural area
  - Historic land cover and water levels
  - Soils
  - Socioeconomic growth
  - Land ownership
- **Examine decisions**
  - Scenario testing
- **Multiple outputs**
  - GIS data layers, map images, reports, tables

Decision Support Tools for Priority Setting

Lake St. Clair ICM Tool



Example Outcomes

Where are there high-quality patches of habitat?

- **Conserve habitat**
- **Restore/create habitat**
- **Restore/create habitat for rare or threatened/endangered species**
- **Restore/create habitat buffers to rivers and streams**
- **Target development**

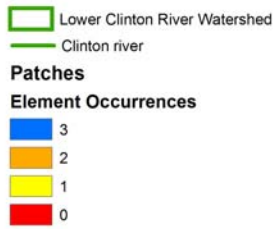
Decision Support Tools for Priority Setting

Lake St. Clair ICM Tool

Example Outcomes

Where are there high-quality patches of habitat?

Why do they score so high?



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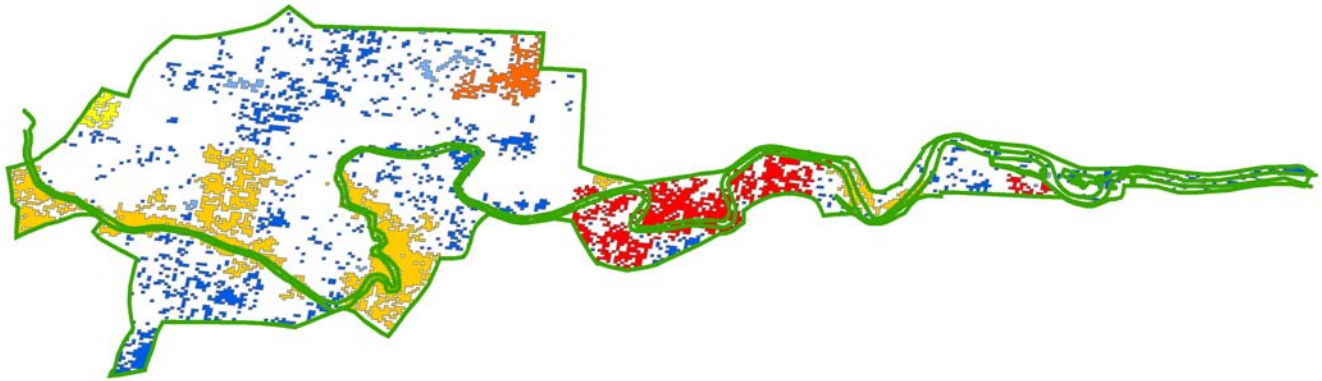
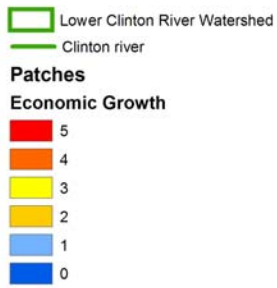
Decision Support Tools for Priority Setting

Lake St. Clair ICM Tool



Example Outcomes



Where are there high-quality patches of habitat?

Why do they score so high?

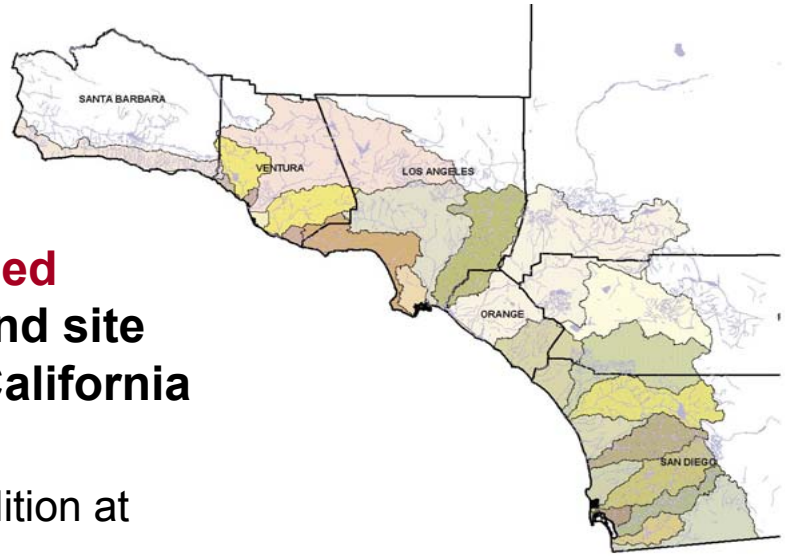
Where is future development predicted?

- **Conserve habitat**
- **Restore/create habitat**
- **Restore/create habitat for rare or threatened/endangered species**
- **Restore/create habitat buffers to rivers and streams**
- **Target development**

Decision Support Tools for Priority Setting

SCREAM DST

- **Developed to examine existing data, identify missing data, and put forth a regional method for watershed analysis of riparian areas**



- **GIS-based tool for analyzing watershed conditions to support the planning and site prioritization goals of the Southern California Wetland Recovery Project**
  - Regional assessment of ecological condition at landscape scale
  - Watershed-based analysis of riparian areas
  - Examination of the functional contributions of habitat, hydrology, and biogeochemistry to the watershed (landscape analyses)
  - Outcomes of analyses feed to identification and prioritization schemes

Decision Support Tools for Priority Setting

Metrics

SCREAM DST

- **Habitat**
  - Vegetative cover
  - Surrounding land use
  - Linear contiguity
  - Lateral contiguity
  - Connection to wetlands
  - Bird diversity
  - Bird rookery
  - Invasive plants
  - Fish passage
  - T/E species
- **Hydrology**
  - Bank material
  - Bed material
  - Entrenchment
  - Catchment land use
  - Flow obstructions
  - Flow restrictions
  - Flow diversions
  - Channel modifications
  - Reduction in infiltration
  - Up-bank interception
  - Treated water releases
  - Impervious surfaces analysis
- **Biogeochemistry**
  - Nutrient source
  - Pesticide sources
  - Trace heavy metal sources
  - Priority organic sources
  - Sinuosity

Decision Support Tools for Priority Setting

SCREAM DST

Components and Functionality

- **Assess habitat condition**
  - Is there natural habitat present in the riparian area and how much?
  - How continuous is the natural habitat along the riparian area?
  - How continuous is the natural habitat away from the riparian area?
  - What is the predominant land cover around the riparian area, with those closer given a higher weight?
  - Is there a wetland adjacent to the riparian area?
  - Is there a large and diverse population of birds in the area?
  - Are birds nesting in the area?
  - Are there invasive plants in the riparian area?
  - Are there threatened and endangered species within the riparian area and nearby?

Decision Support Tools for Priority Setting

SCREAM DST

Components and Functionality

- **Assess biogeochemical condition**
  - Are there nonpoint sources of nutrients, priority organics, trace heavy metals, and pesticides near the riparian area?
  - Does the channel meander (residence time)?
  - Can waters reach the adjacent flood plain (from hydrology)?
  - Is there natural vegetation present in the riparian area (organic matter from habitat)?

Decision Support Tools for Priority Setting

SCREAM DST

Components and Functionality

- **Assess hydrological condition**
  - Can floodwaters reach the adjacent floodplain?
  - Has the stream channel been modified?
  - How many obstructions, restrictions, and diversions are in the watershed?
  - Where has infiltration potential been reduced or altered?
  - Where has runoff potential been increased or altered?
  - What is the percentage of impervious cover in the watershed?

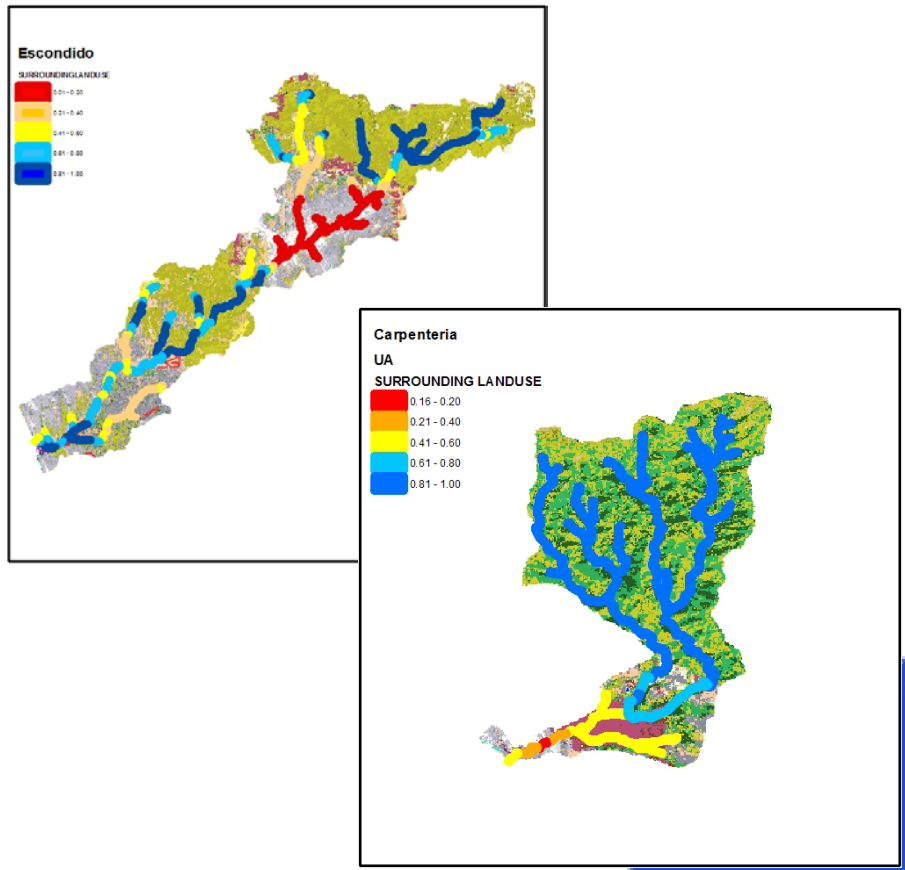
Decision Support Tools for Priority Setting

SCREAM DST

Example Outcomes

What are the predominant land cover types around the riparian area (within a 500 m buffer), with those closer given a higher weight?

- **Quick comparison of watersheds of different sizes, characteristics, and land uses**
- **Understanding of condition of habitat (degrees of altered)**
- **Begin identifying/screening for restoration or conservation areas**



Decision Support Tools for Priority Setting

LCR's Perspective

Development process is critical!

- **Build partnerships, involve stakeholders**
- **Define management needs, tool criteria and design**
- **Consider complexity and flexibility**
- **Train end-users**